

AP[®] Biology

Syllabus 4

EXPECTATIONS

AP[®] Biology is both a hard and a fun course. It provides students with an opportunity to develop a conceptual framework for modern biology, emphasizing applications of biological knowledge and critical thinking to environmental and social concerns. This is a college-level course, and students will be held to high expectations and mature responsibilities just like a college freshman taking Introduction to Biology.

GOALS OF THE COURSE: THEMES AND CONCEPTS

The AP Biology Examination continues to emphasize the concepts and themes of biology. Less weight is placed on specific facts than on the “big ideas” that tie them together. There are two major goals of AP Biology: (1) to enable students to develop a real understanding of the principal concepts in biology and (2) to experience science as a process of problem solving and discovery.

AP Biology at our school accomplishes these two goals in the following way. Each unit is organized and taught with great attention paid to the *themes* below. Lessons are designed to highlight the repeating, overarching themes or patterns that thread their way through three major *topics* (subject areas in biology). Those topics are:

- Molecules and Cells
- Heredity and Evolution
- Organisms and Populations

For example, the theme of energy transfer will help us connect topics as diverse as cellular respiration and ecosystem dynamics. In addition, the context for all *concepts* (the most important ideas that form our current understanding of a particular topic) and lab work is the History and Philosophy of Science, otherwise known as the Nature of Science (NOS).

The eight major themes, as put forth by the College Board, are: [C6]

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|-------------------------------|---|
| 1. Science as a Process (NOS) | 5. Relationship of Structure to Function |
| 2. Evolution | 6. Regulation |
| 3. Energy Transfer | 7. Interdependence in Nature |
| 4. Continuity and Change | 8. Science, Technology, and Society (NOS) |

Of these, evolution is the underlying foundation for all modern biological thought, and this is emphasized in every unit. While the NOS provides a conceptual framework for how science is done, evolution is the common thread that links everything together. As Theodosius Dobzhansky said once, “Nothing in biology makes sense except in the light of evolution.” [C5]

C6—The integration of the general topics of biology through the eight major themes as specified in the Course Description: **Science as Process; Evolution; Energy Transfer; Continuity and Change; Relationship of Structure to Function; Regulation; Interdependence in Nature; Science, Technology, and Society.**

C5—Recognition of evolution as the foundation of modern biological models and thought.

THE MAJOR CONCEPTS (with approximate emphasis on the AP Exam)

- We will study them in a different order than listed below, but the percentages are roughly equivalent in most cases to how much time we will spend during the year on these topics:

1.	Molecules and Cells	25%	[C1]	C1 —Molecules and Cells.
A.	Chemistry of Life	7%		
	Water			
	Organic molecules in organisms			
	Free energy changes			
	Enzymes			
B.	Cells	10%		
	Prokaryotic and eukaryotic cells			
	Membranes			
	Subcellular organization			
	Cell cycle			
C.	Cellular Energetics	8%		
	Coupled reactions			
	Fermentation and cellular respiration			
	Photosynthesis			
2.	Heredity and Evolution	25%	[C2]	C2 —Heredity and Evolution.
A.	Heredity			
	Meiosis and gametogenesis			
	Eukaryotic chromosomes			
	Inheritance patterns			
B.	Molecular Genetics	9%		
	RNA and DNA structure and function			
	Gene regulation			
	Mutation			
	Viral structure and replication			
	Nucleic acid technology and applications			
C.	Evolutionary Biology	8%		
	Early evolution of life			
	Evidence for evolution			
	Mechanisms of evolution			

3. Organisms and Populations	50%	[C3]	C3—Organisms and Populations.
A. Diversity of organisms	8%		
Evolutionary patterns			
Survey of the diversity of life			
Phylogenetic classification			
Evolutionary relationships			
B. Structure and Function of Plants and Animals	32%		
Reproduction, growth, and development			
Structural, physiological, and behavior adaptations			
Response to the environment			
C. Ecology	10%		
Population dynamics			
Communities and ecosystems			
Global issues			

COURSE PLANNER

- The following table (next page) lists, on the left, the units we'll be studying, in sequential order throughout the year, and how many days we will spend on each unit.
- In the right-hand column are listed the AP Biology labs we will be doing that correspond to the units, and how many days we will spend on the lab, including pre- and post-lab discussions.
- Also listed in the right-hand column are all the activities, labs, projects, articles, videos, and assignments done in the Pre-AP® years in biology courses (10th grade) that correspond to major topics and concept areas we will be studying this year. It's helpful to look back at what we've learned in the past and the lab experiences we've done. We have a rather unique situation at our school: When you finally get to AP Biology in 11th or 12th grade, you have already had a solid background in the Nature of Science and many of the biological/biochemical concepts because of your earlier experiences. Since all of you are familiar with the Pre-AP strategies I used in my biology classes, I am able to teach you better in AP Biology classes and spend more time on areas we hadn't learned about previously.

Note: See information after the table to get more details regarding other classroom experiences in addition to labs.

	AP Biology Labs and Pre-AP Biology Background
<p>Introduction (3 days)</p> <p>Chapter 1: Exploring Life</p> <ul style="list-style-type: none"> • Biologists explore life from the microscopic to the global scale • Biological systems are much more than the sum of their parts • Biologists explore life across its great diversity of species • Evolution accounts for life’s unity and diversity • Biologists use various forms of inquiry to explore life • A set of themes connects the concepts of biology 	<p>AP Biology Lab(s): None</p> <p>Physical Science 9th grade—Background:</p> <p>UNIT: The Nature of Science (NOS) (13 DAYS)</p> <ul style="list-style-type: none"> • Activity: Sewer Lice Observations • Activity: The Scientist at Work • Activity: Toothpicks • Assignment: Article “Disputed Comet Theory Shakes Scientific Foundations” & questions • Activity: We See With Our Mind, Not With Our Eyes • Activity: Optical Illusions • Assignment: Article “Why Do Basic Research?” by NSF (National Science Foundation) & questions • Activity: Which is the most creative? Survey • Article: “Friction—Heat Loving Bacterium Roils Two Worlds”—Thomas Brock • Video segment: <i>Contact</i> • Activity: Tube • Activity: Science and Technology Opinion Survey • Discussion: Basic Science versus Applied Science and Technology Development <p>Pre-AP Biology Background:</p> <p>UNIT: The Nature of Science (NOS) (12 DAYS)</p> <ul style="list-style-type: none"> • Activity: The Cube • Video: <i>President Bush’s Special Report to the Nation</i> and discussion • Assignment: Essay—“The Value of Science” by Richard Feynman & questions

AP Biology Labs and Pre-AP Biology Background	
	<ul style="list-style-type: none"> • Assignment—Article: “Stem Cell Division—Issues 2004” and Article: “The Power to Divide—Stem Cells”—Read these articles. Find at least three specific, detailed examples of how science and society are affected by each other from each article, then give an explanation as to how knowing this can be important for students, even those not pursuing a science-related career. [C7] • Activity: Black Box • Assignment: Article “My Life As a Scientist” & questions • Video: <i>Nobel Prize-winning Scientist Richard Feynman</i> • Assignment: Science and Religion Opinion Survey • Video: Stephen J. Gould—<i>About Scientists</i> • Activity: That’s a part of life! • Video: <i>Sensation and Perception</i> • Assignment and Article “Evidence of ‘top quark’ would support basic picture of universe” & questions • Video clip: <i>Contact</i>—different than 9th grade • Assignment: Article “Don’t Tread on My Lab” & questions • Activity: Optical Illusions—different than 9th grade

C7—Applications of biological knowledge and critical thinking to environmental and social concerns.

	AP Biology Labs and Pre-AP Biology Background
<p>Unit 1: Evolution (13 days) [c2, c5]</p> <p>Chapter 22: Descent with Modification: A Darwinian View of Life</p> <ul style="list-style-type: none"> • The Darwinian revolution challenged traditional views of a young Earth inhabited by unchanging species • In <i>The Origin of Species</i>, Darwin proposed that species change through natural selection • Darwin’s theory explains a wide range of observations <p>Chapter 23: The Evolution of Populations</p> <ul style="list-style-type: none"> • Population genetics provides a foundation for studying evolution • Mutation and sexual recombination produce the variation that makes evolution possible • Natural selection, genetic drift, and gene flow can alter a population’s genetic composition • Natural selection is the primary mechanism of adaptive evolution <p>Chapter 24: The Origin of Species</p> <ul style="list-style-type: none"> • The biological species concept emphasizes reproductive isolation • Speciation can take place with or without geographic separation • Macroevolutionary changes can accumulate through many speciation events <p>Chapter 25: Phylogeny and Systematics</p> <ul style="list-style-type: none"> • Phylogenies are based on common ancestries inferred from fossil, morphological, and molecular evidence • Phylogenetic systematics connects classification with evolutionary history 	<p>AP Biology Lab(s): [c8]</p> <p>Lab 8: Population Genetics and Evolution (2 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Evidence for Evolution (15 DAYS)</p> <ul style="list-style-type: none"> • Activity: Dinosaur Extinction: Drugs, Sex, and Rocks from Space • Activity: Geologic Time Line • Activity: Eastern Iowa Fossils • Activity: Biochemical Evidence • Activity: How Can Patterns of Variation Help Explain Evolution? • Activity: Hardy-Weinberg Investigation • Activity: Natural Selection Worksheet • Activity: Sickle Cell Disease • Activity: A Step in Speciation—Salamanders • Activity: Human Evolution • Activity: Human Cranial Volume • Video: <i>Lemmings</i> • Video: <i>Death of the Dinosaurs</i> • Article: “Carriers of Extinction—Disease and Dinosaurs” • Article: “Repeated Blows—ET Collisions” • Article: “The Smoking Crater” • Article: “What Wiped Out the Dinosaurs—Climate Change”

C2—Heredity and Evolution.

C5—Recognition of evolution as the foundation of modern biological models and thought.

C8—The course includes a laboratory component that fulfills all of the objectives of the recommended AP Biology labs as listed in the Course Description. Students must spend a minimum of 25% of instructional time engaged in hands-on laboratory work. Note: Online course providers utilizing virtual labs (simulations rather than hands-on) should submit their laboratory materials for the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses which use these labs may receive authorization to use the “AP” designation. Online science courses authorized to use the “AP” designation will be posted on the AP Central website.

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> Phylogenetic systematics informs the construction of phylogenetic trees based on shared characters Much of an organism's evolutionary history is documented in its genome Molecular clocks help track evolutionary time 	
<p>Unit 2: Diversity (6 days) [C3]</p> <p>Chapter 26: The Tree of Life: An Introduction to Biological Diversity</p> <ul style="list-style-type: none"> Conditions on early Earth made the origin of life possible The fossil record chronicles life on Earth As prokaryotes evolved, they exploited and changed young Earth Eukaryotic cells arose from symbioses and genetic exchanges among prokaryotes Multicellularity evolved several times in eukaryotes New information has revised our understanding of the tree of life <p>Chapter 27: Prokaryotes</p> <ul style="list-style-type: none"> Structural, functional, and genetic adaptations contribute to prokaryotic success A great diversity of nutritional and metabolic adaptations have evolved in prokaryotes Molecular systematics is illuminating prokaryotic phylogeny Prokaryotes play crucial roles in the biosphere Prokaryotes have both harmful and beneficial impacts on humans <p>Chapter 28: Protists</p> <ul style="list-style-type: none"> Protists are an extremely diverse assortment of eukaryotes Diplomonads and parabasalids have modified mitochondria Euglenozoans have flagella with a unique internal structure 	<p>AP Biology Lab(s): None</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Epidemiology, Microorganisms, Human Disease, and the Immune System (19 DAYS)</p> <ul style="list-style-type: none"> Video: <i>Classic Saturday Night Live</i>—"Theodoric of York, Medieval Barber" Activity: Kitchen Safety Quiz Articles: E. coli, Salmonella cases blamed on lettuce Comparison of Disease Agents Chart Activity: Ignaz Semmelweis Dilemma Activity: Epidemic! Article "Examining the History of Research About Viruses—Scientific Thinking and Real Science versus Published Science & questions" Article "Is the Scientific Paper a Fraud?" Video: <i>Danger Zone</i> Project: Pandemic Internet Research Brochure Article: "Red Tape Choking Us" Article: "A Fast & Furious Virus" Article: "Epidemics Spread As Economies Crumble" Article: "The Next Killer Flu—Can We Stop It?" Video: <i>Medical Investigations Season Premiere</i>

C3—Organisms and Populations.

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> • Alveolates have sacs beneath the plasma membrane • Stramenopiles have “hairy” and smooth flagella • Cercozoans and radiolarians have threadlike pseudopodia • Amoebozoans have lobe-shaped pseudopodia • Red algae and green algae are the closest relatives of land plants <p>Chapter 31: Fungi</p> <ul style="list-style-type: none"> • Fungi are heterotrophs that feed by absorption • Fungi produce spores through sexual or asexual life cycles • Fungi descended from an aquatic, single-celled, flagellated ancestor • Fungi have radiated into a diverse set of lineages • Fungi have a powerful impact on ecosystems and human welfare <p>Chapter 32: An Introduction to Animal Diversity</p> <ul style="list-style-type: none"> • Animals are multicellular, heterotrophic, eukaryotes with tissues that develop from embryonic layers • The history of animals may span more than a billion years • Animals can be characterized by “body plans” • Leading hypotheses agree on major features of the animal phylogenetic tree 	<ul style="list-style-type: none"> • Assignment: Patient Diagnosis—Protozoan Diseases • Video: <i>What’s Killing the Children?</i> • Article: Revised Guidelines for Preventing Poliomyelitis • Video: <i>Can You Still Get Polio?</i> • Video: <i>Body Atlas—Defend and Repair</i> • Assignment: What Provides Immunity? • Assignment: Concept Mapping the Immune System • Video: <i>Immune System Segment—Star Wars Version</i> • Article: “Home, Bacteria-Ridden Home” and Others • Video: <i>HIV and AIDS</i> • Article from 1983: “New Syndrome Seen in Deaths of Gay Men” • Activity: A Debate on the Origins of a Plague • Video—<i>Exposé on Restaurant Safe Food Guidelines and Practices</i> • Article: “Arkansas Makes Poor Showing in Restaurant Food Safety”

	AP Biology Labs and Pre-AP Biology Background
<p>Chapter 33: Invertebrates</p> <ul style="list-style-type: none"> • Sponges are sessile and have a porous body and choanocytes • Cnidarians have radial symmetry, a gastrovascular cavity, and cnidocytes • Most animals have bilateral symmetry • Mollusks have a muscular foot, a visceral mass, and a mantle • Annelids are segmented worms • Nematodes are nonsegmented pseudocoelomates covered by a tough cuticle • Arthropods are segmented coelomates that have an exoskeleton and jointed appendages • Echinoderms and chordates are deuterostomes <p>Chapter 34: Vertebrates</p> <ul style="list-style-type: none"> • Chordates have a notochord and a dorsal, hollow nerve cord • Craniates are chordates that have a head • Vertebrates are craniates that have a backbone • Gnathostomes are vertebrates that have jaws • Tetrapods are gnathostomes that have limbs and feet • Amniotes are tetrapods that have a terrestrially adapted egg • Mammals are amniotes that have hair and produce milk • Humans are bipedal hominids with a large brain 	

AP Biology Labs and Pre-AP Biology Background		
<p>Unit 3: Ecology (14.5 days) Chapter 50: An Introduction to Ecology and the Biosphere</p> <ul style="list-style-type: none"> • Ecology is the study of interactions between organisms and the environment • Interactions between organisms and the environment limit the distribution of species • Abiotic and biotic factors influence the structure and dynamics of aquatic biomes • Climate largely determines the distribution and structure of terrestrial biomes <p>Chapter 51: Behavioral Ecology [C5]</p> <ul style="list-style-type: none"> • Behavioral ecologists distinguish between proximate and ultimate causes of behavior • Many behaviors have a strong genetic component • Environment, interacting with an animal's genetic makeup, influences the development of behaviors • Behavioral traits can evolve by natural selection • Natural selection favors behaviors that increase survival and reproductive success • The concept of inclusive fitness can account for most altruistic social behavior <p>Chapter 52: Population Ecology</p> <ul style="list-style-type: none"> • Dynamic biological processes influence population density, dispersion, and demography • Life history traits are products of natural selection • The exponential model describes population growth in an idealized, unlimited environment • The logistic growth model includes the concept of carrying capacity 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 11: Animal Behavior (2 DAYS)</p> <p>Lab 12: Dissolved Oxygen and Primary Productivity (5 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Population Biology (7 DAYS)</p> <ul style="list-style-type: none"> • Activity: Sparrow Island • Activity: Yeast Population Study • Activity: Population Changes in Open Systems • Activity: Human Population Growth • Activity: Hoot Woods Predator-Prey Simulation • Video: <i>Red Wolf Rehabilitation</i> • Video: <i>Mountain Lions and People</i> • Video: <i>White-Tail Deer Population Issues</i> • Article: "The Numbers Game" • Article: "Is That a Mountain Lion in Your Backyard?" • Article: "Mountain Lions Don't Stalk People, True or False?" 	<p>C5—Recognition of evolution as the foundation of modern biological models and thought.</p>
		<p>C8—The course includes a laboratory component that fulfills all of the objectives of the recommended AP Biology labs as listed in the Course Description. Students must spend a minimum of 25% of instructional time engaged in hands-on laboratory work. Note: Online course providers utilizing virtual labs (simulations rather than hands-on) should submit their laboratory materials for the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses which use these labs may receive authorization to use the "AP" designation. Online science courses authorized to use the "AP" designation will be posted on the AP Central website.</p>

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> • Populations are regulated by a complex interaction of biotic and abiotic influences • Human population growth has slowed after centuries of exponential increase <p>Chapter 53: Community Ecology</p> <ul style="list-style-type: none"> • A community's interactions include competition, predation, herbivory, symbiosis, and disease • Dominant and keystone species exert strong controls on community structure • Disturbance influences species diversity and composition • Biogeographic factors affect community biodiversity • Contrasting views of community structure are the subject of continuing debate (NOS) <p>Chapter 54: Ecosystems</p> <ul style="list-style-type: none"> • Ecosystem ecology emphasizes energy flow and chemical cycling • Physical and chemical factors limit primary production in ecosystems • Energy transfer between trophic levels is usually less than 20 percent efficient • Biological and geochemical processes move nutrients between organic and inorganic parts of the ecosystem • The human population is disrupting chemical cycles throughout the biosphere <p>Chapter 55: Conservation Biology and Restoration Ecology [C7]</p> <ul style="list-style-type: none"> • Human activities threaten Earth's biodiversity • Population conservation focuses on population size, genetic diversity, and critical habitat 	

C7—Applications of biological knowledge and critical thinking to environmental and social concerns.

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> • Landscape and regional conservation aim to sustain entire biotas • Restoration ecology attempts to restore degraded ecosystems to a more natural state • Sustainable development seeks to improve the human condition while conserving biodiversity 	
<p>Unit 4: Biochemistry (12.5 days) [C1]</p> <p>Chapter 2: The Chemical Context of Life</p> <ul style="list-style-type: none"> • Matter consists of chemical elements in pure form and in combinations called compounds • An element’s properties depend on the structure of its atoms • The formation and function of molecules depend on chemical bonding between atoms • Chemical reactions make and break chemical bonds <p>Chapter 3: Water and the Fitness of the Environment</p> <ul style="list-style-type: none"> • The polarity of water molecules results in hydrogen bonding • Four emergent properties of water contribute to Earth’s fitness for life • Dissociation of water molecules leads to acidic and basic conditions that affect living things <p>Chapter 4: Carbon and the Molecular Diversity of Life</p> <ul style="list-style-type: none"> • Organic chemistry is the study of carbon compounds • Carbon atoms can form diverse molecules by bonding to four other atoms • Functional groups are the parts of molecules involved in chemical reactions 	<p>AP Biology Lab(s): None</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Biochemistry (14 DAYS)</p> <ul style="list-style-type: none"> • Activity: Label Reading—Are You What You Eat? • Activity: Chemistry of Carbohydrates • Activity: Counting Calories • Assignment: Graphing Practice—Using Techniques of Proper Graphing • Activity: Liver Power and Enzymes • Activity: Chemistry of Fats and Proteins • Project: Food Engineering Product • Video: <i>Fear of Fat</i> • Article: “A Recipe for Longer Life” • Activity: How Food Labels Work—Making Food Labels • Article: “The supersized generation” • Article: “Doctors Say Adult Onset Diabetes Is on the Rise—In Kids” • Activity: Make-it-Yourself pH Indicator • Activity: Spit Lab—What Influences Enzyme Activity?

C1—Molecules and Cells.

AP Biology Labs and Pre-AP Biology Background	
<p>Chapter 5: The Structure and Function of Macromolecules</p> <ul style="list-style-type: none"> • Most macromolecules are polymers, built from monomers • Carbohydrates serve as fuel and building material • Lipids are a diverse group of hydrophobic molecules • Proteins have many structures, resulting in a wide range of functions • Nucleic acids store and transmit hereditary information 	
<p>Unit 5: Cells/Cell Cycle (14 days) [C1]</p> <p>Chapter 6: A Tour of the Cell</p> <ul style="list-style-type: none"> • To study cells, biologists use microscopes and the tools of biochemistry • Eukaryotic cells have internal membranes that compartmentalize their functions • The eukaryotic cell’s genetic instructions are housed in the nucleus and carried out by the ribosomes • The endomembrane system regulates protein traffic and performs metabolic functions in the cell • Mitochondria and chloroplasts change energy from one form to another • The cytoskeleton is a network of fibers that organizes structures and activities in the cell • Extracellular components and connections between cells help coordinate cellular activities 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 1: Osmosis & Diffusion (4 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Cell Biology, Membrane Transport, Cell Reproduction (23 DAYS)</p> <ul style="list-style-type: none"> • Activity: Techniques for Better Microscope Use • Article: “The Cell” • Article: “Major Events in Cell Biology” • Activity: Microscopic Measurement • Assignment: Concept Mapping the Cell • Activity: Investigating the Basic Unit of Life, the Cell • Project: Learning While Cartooning the Cell • Activity: Baggie Lab • Activity: Egg Lab • Activity: Salad Lab • Video: <i>Cell Membranes</i> • Video: <i>Homeostasis</i>
	<p>C1—Molecules and Cells.</p> <p>C8—The course includes a laboratory component that fulfills all of the objectives of the recommended AP Biology labs as listed in the Course Description. Students must spend a minimum of 25% of instructional time engaged in hands-on laboratory work. Note: Online course providers utilizing virtual labs (simulations rather than hands-on) should submit their laboratory materials for the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses which use these labs may receive authorization to use the “AP” designation. Online science courses authorized to use the “AP” designation will be posted on the AP Central website.</p>

	AP Biology Labs and Pre-AP Biology Background
<p>Chapter 7: Membrane Structure and Function</p> <ul style="list-style-type: none"> Cellular membranes are fluid mosaics of lipids and proteins Membrane structure results in selective permeability Passive transport is diffusion of a substance across a membrane with no energy investment Active transport uses energy to move solutes against their gradients Bulk transport across the plasma membrane occurs by exocytosis and endocytosis <p>Chapter 11: Cell Communication</p> <ul style="list-style-type: none"> External signals are converted into responses within the cell Reception: a signal molecule binds to a receptor protein, causing it to change shape Transduction: cascades of molecular interactions relay signals from receptors to target molecules in the cell Response: cell signaling leads to regulation of cytoplasmic activities or transcription <p>Chapter 12: The Cell Cycle</p> <ul style="list-style-type: none"> Cell division results in genetically identical daughter cells The mitotic phase alternates with interphase in the cell cycle The cell cycle is regulated by a molecular control system 	<ul style="list-style-type: none"> Activity: Mitosis, the Threads of Life (Walter Flemming) Activity: Mitosis—Phase Time in Cells Activity: The Enemy Within—Cancer Article: “The Enemy Within” Article: “Protein Makes Cancer Cells Self-Destruct” Article: “Engineers Light Up Cancer Research”
<p>Unit 6: Animal Structure and Function Part I</p> <p>Chapter 40: Basic Principles of Animal Form and Function</p> <ul style="list-style-type: none"> Physical laws and the environment constrain animal size and shape 	<p>AP Biology Lab(s): None</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Mini-Medical School and Residencies (25 DAYS)</p>

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> • Animal form and function are correlated at all levels of organization • Animals use the chemical energy in food to sustain form and function • Many animals regulate their internal environment within relatively narrow limits • Thermoregulation contributes to homeostasis and involves anatomy, physiology, and behavior <p>a) Excretory System/Osmoregulation (4.5 days)</p> <p>Chapter 44: Osmoregulation and Excretion</p> <ul style="list-style-type: none"> • Osmoregulation balances the uptake and loss of water and solutes • An animal’s nitrogenous wastes reflect its phylogeny and habitat • Diverse excretory systems are variations on a tubular theme • Nephrons and associated blood vessels are the functional units of the mammalian kidney • The mammalian kidney’s ability to conserve water is a key terrestrial adaptation • Diverse adaptations of the vertebrate kidney have evolved in different environments <p>b) Nervous System (4 days)</p> <p>Chapter 48: Nervous Systems</p> <ul style="list-style-type: none"> • Nervous systems consist of circuits of neurons and supporting cells • Ion pumps and ion channels maintain the resting potential of a neuron • Action potentials are the signals conducted by axons • Neurons communicate with other cells at synapses • The vertebrate nervous system is regionally specialized 	<ul style="list-style-type: none"> • Self-Directed Major Student Project: Mini-Medical School and Residencies. Using the “New Pathways” curriculum of Harvard Medical School as a model, students work in a self-directed manner to fill out study guides for 10 major body systems, learning both anatomy and physiology of the system. Within the parameters of deadlines, students pace themselves, taking quizzes over systems and completing study guides to help them prepare. The study guides require them to learn the anatomy of each system, describe the major functional physiology and purpose of each system, use the Nature of Science (NOS) to learn medical history about the system and read articles about those events, concept map the key points of the system, and describe at least five major ailments that commonly affect people when the system is not working properly. It culminates in a major exam called the “Board Exam,” and students then sign up for residencies in areas of interest. They are given two virtual patients with ailments, diagnose and prescribe treatment (without killing the patient!), and choose one to present at grand rounds.

AP Biology Labs and Pre-AP Biology Background	
<ul style="list-style-type: none"> The cerebral cortex controls voluntary movement and cognitive functions CNS (Central Nervous System) injuries and diseases are the focus of much research 	
<p>Unit 7: Enzymes/Metabolism/Cellular Respiration (16.5 days) [C1]</p> <ul style="list-style-type: none"> An organism's metabolism transforms matter and energy, subject to the laws of thermodynamics The free-energy change of a reaction tells us whether the reaction occurs spontaneously ATP (adenosine triphosphate) powers cellular work by coupling exergonic reactions to endergonic reactions Enzymes speed up metabolic reactions by lowering energy barriers Regulation of enzyme activity helps control metabolism <p>Chapter 9: Cellular Respiration: Harvesting Chemical Energy</p> <ul style="list-style-type: none"> Catabolic pathways yield energy by oxidizing organic fuels Glycolysis harvests chemical energy by oxidizing glucose to pyruvate The citric acid cycle completes the energy-yielding oxidation of organic molecules During oxidative phosphorylation, chemiosmosis couples electron transport to ATP synthesis Fermentation enables some cells to produce ATP without the use of oxygen Glycolysis and the citric acid cycle connect to many other metabolic pathways 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 2: Enzyme Catalysis & Toothpickase (5 DAYS)</p> <p>Lab 5: Cell Respiration (4 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Cellular Energetics (6 DAYS)</p> <ul style="list-style-type: none"> Activity: Aerobic Respiration Lab

C1—Molecules and Cells.

C8—The course includes a laboratory component that fulfills all of the objectives of the recommended AP Biology labs as listed in the Course Description. Students must spend a minimum of 25% of instructional time engaged in hands-on laboratory work. Note: Online course providers utilizing virtual labs (simulations rather than hands-on) should submit their laboratory materials for the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses which use these labs may receive authorization to use the "AP" designation. Online science courses authorized to use the "AP" designation will be posted on the AP Central website.

	AP Biology Labs and Pre-AP Biology Background
<p>Unit 8: Animal Structure and Function Part II</p> <p>a) Animal Nutrition/Digestion (3 days)</p> <p>Chapter 41: Animal Nutrition</p> <ul style="list-style-type: none"> • Homeostatic mechanisms manage an animal’s energy budget • An animal’s diet must supply carbon skeletons and essential nutrients • The main stages of food processing are ingestion, digestion, absorption, and elimination • Each organ of the mammalian digestive system has specialized food-processing functions • Evolutionary adaptations of vertebrate digestive systems are often associated with diet <p>b) Circulatory System/Gas Exchange (5 days)</p> <p>Chapter 42: Circulation and Gas Exchange</p> <ul style="list-style-type: none"> • Circulatory systems reflect phylogeny • Double circulation in mammals depends on the anatomy and pumping cycle of the heart • Physical principles govern blood circulation • Blood is a connective tissue with cells suspended in plasma • Gas exchange occurs across specialized respiratory surfaces • Breathing ventilates the lungs • Respiratory pigments bind and transport gases 	<p>AP® Biology Lab(s): [C8]</p> <p>Lab 10: Blood Physiology and the Circulatory System (2 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Mini-Medical School and Residencies (25 DAYS)</p> <ul style="list-style-type: none"> • Self-Directed Major Student Project: Mini-Medical School and Residencies. Using the “New Pathways” curriculum of Harvard Medical School as a model, students work in a self-directed manner to fill out study guides for 10 major body systems, learning both anatomy and physiology of the system. Within the parameters of deadlines, students pace themselves, taking quizzes over systems and completing study guides to help them prepare. The study guides require them to learn the anatomy of each system, describe the major functional physiology and purpose of each system, use the Nature of Science (NOS) to learn medical history about the system and read articles about those events, concept map the key points of the system, and describe at least five major ailments that commonly affect people when the system is not working properly. It culminates in a major exam called the “Board Exam,” and students then sign up for residencies in areas of interest. They are given two virtual patients with ailments, diagnose and prescribe treatment (without killing the patient!), and choose one to present at grand rounds.

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	AP Biology Labs and Pre-AP Biology Background
<p>c) Immune/Lymph System (3.5 days)</p> <p>Chapter 43: The Immune System</p> <ul style="list-style-type: none"> • Innate immunity provides broad defenses against infection • In acquired immunity, lymphocytes provide specific defenses against infection • Humoral and cell-mediated immunity defend against different types of threats • The immune system's ability to distinguish self from nonself limits tissue transplantation • Exaggerated, self-directed, or diminished immune responses can cause disease <p>d) Motor/Skeletal System (3.5 days)</p> <p>Chapter 49: Sensory and Motor Mechanisms</p> <ul style="list-style-type: none"> • Sensory receptors transduce stimulus energy and transmit signals to the central nervous system • The mechanoreceptors involved with hearing and equilibrium detect settling particles or moving fluid • The senses of taste and smell are closely related in most animals • Similar mechanisms underlie vision throughout the animal kingdom • Animal skeletons function in support, protection, and movement • Muscles move skeletal parts by contracting • Locomotion requires energy to overcome friction and gravity 	

AP Biology Labs and Pre-AP Biology Background	
<p>Unit 9: Photosynthesis (7.5 days)</p> <p>Chapter 10: Photosynthesis</p> <ul style="list-style-type: none"> • Photosynthesis converts light energy to the chemical energy of food • The light reactions convert solar energy to the chemical energy of ATP and NADPH (nicotinamide adenine dinucleotide phosphate-oxidase) • The Calvin cycle uses ATP and NADPH to convert CO₂ to sugar • Alternative mechanisms of carbon fixation have evolved in hot, arid climates 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 4: Plant Pigments and Photosynthesis (4 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Cellular Energetics (6 DAYS)</p> <ul style="list-style-type: none"> • Activity: Leaf Structure Lab • Activity: Number of Stomates Lab • Activity: Separating Leaf Pigments Lab
<p>Unit 10: Plant Evolution/Plant Structure and Function (14.5 days)</p> <p>Chapter 29: Plant Diversity I: How Plants Colonized Land [C5]</p> <ul style="list-style-type: none"> • Land plants evolved from green algae • Land plants possess a set of derived terrestrial adaptations • The life cycles of mosses and other bryophytes are dominated by the gametophyte stage • Ferns and other seedless vascular plants formed the first forests <p>Chapter 30: Plant Diversity II: The Evolution of Seed Plants</p> <ul style="list-style-type: none"> • The reduced gametophytes of seed plants are protected in ovules and pollen grains • Gynospers bear “naked” seeds, typically on cones • The reproductive adaptations of angiosperms include flowers and fruits • Human welfare depends greatly on seed plants 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 9: Transpiration (4 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Cellular Energetics (6 DAYS) same as above</p> <ul style="list-style-type: none"> • Activity: Leaf Structure Lab • Activity: Number of Stomates Lab • Activity: Separating Leaf Pigments Lab

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C5—Recognition of evolution as the foundation of modern biological models and thought.

	AP Biology Labs and Pre-AP Biology Background
<p>Chapter 35: Plant Structure, Growth, and Development</p> <ul style="list-style-type: none"> • The plant body has a hierarchy of organs, tissues, and cells • Meristems generate cells for new organs • Primary growth lengthens roots and shoots • Secondary growth adds girth to stems and roots in woody plants • Growth, morphogenesis, and differentiation produce the plant body <p>Chapter 36: Transport in Vascular Plants</p> <ul style="list-style-type: none"> • Physical forces drive the transport of materials in plants over a range of distances • Roots absorb water and minerals from the soil • Water and minerals ascend from roots to shoots through the xylem • Stomata help regulate the rate of transpiration • Organic nutrients are translocated through the phloem <p>Chapter 37: Plant Nutrition</p> <ul style="list-style-type: none"> • Plants require certain chemical elements to complete their life cycle • Soil quality is a major determinant of plant distribution and growth • Nitrogen is often the mineral that has the greatest effect on plant growth • Plant nutritional adaptations often involve relationships with other organisms 	

	AP Biology Labs and Pre-AP Biology Background	
<p>Chapter 38: Angiosperm Reproduction and Biotechnology</p> <ul style="list-style-type: none"> • Pollination enables gametes to come together within a flower • After fertilization, ovules develop into seeds and ovaries into fruits • Many flowering plants clone themselves by asexual reproduction • Plant biotechnology is transforming agriculture <p>Chapter 39: Plant Responses to Internal and External Signals</p> <ul style="list-style-type: none"> • Signal transduction pathways link signal reception to response • Plant hormones help coordinate growth, development, and responses to stimuli • Responses to light are critical for plant success • Plants respond to a wide variety of stimuli other than light • Plants defend themselves against herbivores and pathogens 		<p>C2—Heredity and Evolution.</p> <p>C8—The course includes a laboratory component that fulfills all of the objectives of the recommended AP Biology labs as listed in the Course Description. Students must spend a minimum of 25% of instructional time engaged in hands-on laboratory work. Note: Online course providers utilizing virtual labs (simulations rather than hands-on) should submit their laboratory materials for the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses which use these labs may receive authorization to use the “AP” designation. Online science courses authorized to use the “AP” designation will be posted on the AP Central website.</p>
<p>Unit 11: Meiosis/Genetics/Heredity (14.5 days) [C2]</p> <p>Chapter 13: Meiosis and Sexual Life Cycles</p> <ul style="list-style-type: none"> • Offspring acquire genes from parents by inheriting chromosomes • Fertilization and meiosis alternate in sexual life cycles • Meiosis reduces the number of chromosome sets from diploid to haploid • Genetic variation produced in sexual life cycles contributes to evolution 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 3: Mitosis & Meiosis (4 DAYS)</p> <p>Lab 7: Genetics of Drosophila (4 DAYS)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Mendelian Genetics (22 DAYS)</p> <ul style="list-style-type: none"> • Activity: Genetics Facts and Fallacies • Video: <i>Simulations of Mitosis and Meiosis</i> 	

	AP Biology Labs and Pre-AP Biology Background
<p>Chapter 14: Mendel and the Gene Idea</p> <ul style="list-style-type: none"> Mendel used the scientific approach to identify two laws of inheritance The laws of probability govern Mendelian inheritance Inheritance patterns are often more complex than predicted by simple Mendelian genetics Many human traits follow Mendelian patterns of inheritance <p>Chapter 15: The Chromosomal Basis of Inheritance</p> <ul style="list-style-type: none"> Mendelian inheritance has its physical basis in the behavior of chromosomes Linked genes tend to be inherited together because they are located near each other on the same chromosome Sex-linked genes exhibit unique patterns of inheritance Alterations of chromosome number or structure cause some genetic disorders Some inheritance patterns are exceptions to the standard chromosome theory 	<ul style="list-style-type: none"> Web sites: Mitosis versus Meiosis Demos Activity: Cartoon history of genetics Activity: CATLAB computer simulation Activity: Monohybrid Genetics Problems Activity: Say, You Look JUST Like... Activity: Probability and Monohybrid Corn Activity: Solving Dihybrid Problems Activity: Dihybrid Corn Lab Activity: Karyotype Slides Activity: Do Genes Determine Our Future? Activity: The Case of Nathaniel Wu Video: <i>Greatest Discoveries with Bill Nye—Genetics</i> Activity: Pedigrees—Barras Family Pedigree and Mr. Beisel—Real Family History Activity: Human Pedigree Genetics Activity: X-Linkage Problems and Pedigrees Video clip: from <i>Lorenzo's Oil</i> Activity: Ultimate Pedigree Challenge
<p>Unit 12: Molecular Genetics/ Biotechnology (13.5 days)</p> <p>Chapter 16: The Molecular Basis of Inheritance</p> <ul style="list-style-type: none"> DNA is the genetic material Many proteins work together in DNA replication and repair 	<p>AP Biology Lab(s): [C8]</p> <p>Lab 6a: Transformation of <i>E. coli</i></p> <p>Lab 6b: DNA Fingerprinting</p> <p>(6 DAYS TOTAL)</p> <p>Pre-AP Biology Background:</p> <p>UNIT: Molecular Genetics/ Biotechnology (24 DAYS)</p>

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	AP Biology Labs and Pre-AP Biology Background
<p>Chapter 17: From Gene to Protein</p> <ul style="list-style-type: none"> • Genes specify proteins via transcription and translation • Transcription is the DNA-directed synthesis of RNA • Eukaryotic cells modify RNA after transcription • Translation is the RNA-directed synthesis of a polypeptide • RNA plays multiple roles in the cell • Comparing gene expression in prokaryotes and eukaryotes reveals key differences • Point mutations can affect protein structure and function <p>Chapter 18: The Genetics of Viruses and Bacteria</p> <ul style="list-style-type: none"> • A virus has a genome but can reproduce only within a host cell • Viruses, viroids, and prions are formidable pathogens in animals and plants • Rapid reproduction, mutation, and genetic recombination contribute to the genetic diversity of bacteria • Individual bacteria respond to environmental change by regulating gene expression <p>Chapter 19: Eukaryotic Genomes: Organization, Regulation, and Evolution</p> <ul style="list-style-type: none"> • Chromatin structure is based on successive levels of DNA packing • Gene expression can be regulated at any stage, but the key step is transcription • Cancer results from genetic changes that affect cell cycle control • Eukaryotic genomes can have many noncoding DNA sequences in addition to genes 	<ul style="list-style-type: none"> • Video: <i>Race for the Double Helix</i> (with Jeff Goldblum) • Video: <i>DNA Replication</i> • Activity: DNA/RNA Up Close • Video: <i>Protein, the Stuff of Life</i> • Video: <i>DNA, the Molecule of Heredity</i> • Activity: tRNA and Protein Building • Video: <i>Review of Protein Synthesis</i> (Howard Hughes Foundation video) • Assignment: Outlining the Steps in Protein Synthesis • Video: <i>RNA Synthesis</i> • Video: <i>Ribosomal RNA</i> • Video: <i>Transfer RNA</i> • Activity: Transcription/ Translation Wall Activity • Activity: How to Use the Protein Synthesis Table • Video: GATTACA • Article: “Researchers Creating Life from Scratch” • Article: “Government Adviser—Killing Children with Defects Acceptable” • Article: “Major Breakthroughs in Stem Cell Research” • Article: “Made to Order Babies” • Debate: “Made to Order Babies” • Article: “The Case Against Perfection” • Article: “Animal-Human Hybrids Spark Controversy” • Article: “Eugenics and Other Areas of Concern” • Video: Using <i>Biotechnology to Solve Crimes</i> • Activity: Genetic Engineering Cartoons [C7]

C7—Applications of biological knowledge and critical thinking to environmental and social concerns.

	AP Biology Labs and Pre-AP Biology Background
<ul style="list-style-type: none"> • Duplications, rearrangements, and mutations of DNA contribute to genome evolution <p>Chapter 20: DNA Technology and Genomics</p> <ul style="list-style-type: none"> • DNA cloning permits production of multiple copies of a specific gene or other DNA segment • Restriction fragment analysis detects DNA differences that affect restriction sites • Entire genomes can be mapped at the DNA level • Genome sequences provide clues to important biological questions • The practical applications of DNA technology affect our lives in many ways <p>Chapter 21: The Genetic Basis of Development</p> <ul style="list-style-type: none"> • Embryonic development involves cell division, cell differentiation, and morphogenesis • Different cell types result from differential gene expression in cells with the same DNA • Pattern formation in animals and plants results from similar genetic and cellular mechanisms • Comparative studies help explain how the evolution of development leads to morphological diversity 	<ul style="list-style-type: none"> • Video: <i>DNA Fingerprinting—Newton’s Apple</i> • Activity: Lab 13B—Direct Detection of Genetic Disorders Using RFLP (restriction fragment length polymorphism) • Activity: Genetic Anticipation—Exception to Mendel’s Rules • Activity: Gene Splicing and Bacterial Plasmids • Activity: Lab—DNA Isolation and Extraction from Onion

	AP Biology Labs and Pre-AP Biology Background
<p>Unit 13: Animal Structure and Function Part III</p> <p>a) Animal Reproduction (3.5 days)</p> <p>Chapter 46: Animal Reproduction</p> <ul style="list-style-type: none"> • Both asexual and sexual reproduction occur in the animal kingdom • Fertilization depends on mechanism that help sperm meet eggs of the same species • Reproductive organs produce and transport gametes: focus on humans • In humans and other mammals, a complex interplay of hormones regulates gametogenesis • In humans and other placental mammals, an embryo grows into a newborn in the mother’s uterus <p>b) Hormones and Regulation (3.5 days)</p> <p>Chapter 45: Hormones and the Endocrine System</p> <ul style="list-style-type: none"> • The endocrine system and the nervous system act individually and together in regulating an animal’s physiology • Hormones and other chemical signals bind to target cell receptors in target cells, initiating pathways that culminate in specific cell responses • The hypothalamus and pituitary gland integrate many functions of the vertebrate endocrine system • Nonpituitary hormones help regulate metabolism, homeostasis, development, and behavior • Invertebrate regulatory systems also involve endocrine and nervous system interactions 	<p>Pre-AP Biology Background:</p> <p>UNIT: Mini-Medical School and Residencies (25 DAYS)</p> <ul style="list-style-type: none"> • Self-Directed Major Student Project: Mini-Medical School and Residencies. Using the “New Pathways” curriculum of Harvard Medical School as a model, students work in a self-directed manner to fill out study guides for 10 major body systems, learning both anatomy and physiology of the system. Within the parameters of deadlines, students pace themselves, taking quizzes over systems and completing study guides to help them prepare. The study guides require them to learn the anatomy of each system, describe the major functional physiology and purpose of each system, use the Nature of Science (NOS) to learn medical history about the system and read articles about those events, concept map the key points of the system, and describe at least five major ailments that commonly affect people when the system is not working properly. It culminates in a major exam called the “Board Exam,” and students then sign up for residencies in areas of interest. They are given two virtual patients with ailments, diagnose and prescribe treatment (without killing the patient!), and choose one to present at grand rounds.

	AP Biology Labs and Pre-AP Biology Background
Unit 14: Animal Development (3 days) Chapter 47: Animal Development <ul style="list-style-type: none"> • After fertilization, embryonic development proceeds through cleavage, gastrulation, and organogenesis • Morphogenesis in animals involves specific changes in cell shape, position, and adhesion • The developmental fate of cells depends on their history and on inductive signals 	Pre-AP Biology Background: None
TOTAL: 164 class days, with 46 lab days scheduled in.	Total 28% lab work, minimum [c8]

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REQUIRED STUDENT MATERIALS

- Textbook: *Biology, AP® Edition*, Campbell, Neil A. and J. Reece, 7th edition (2005)—provided by Lutheran High School
- Review Guide: *Biology (Cliff’s AP®)*, Pack, Phillip E., 2nd Edition (2001)—can be purchased at places like <http://www.amazon.com/> for cheaper prices.
- Pen AND Pencil
- Scientific calculator
- Black and white lab notebook (bound composition, graph format, not lined)
- Essay Notebook (bound composition)
- Colored pencils (small set)
- Three-ring binder/folder to organize notes and handouts

CLASS SCHEDULING

- AP Biology is held during first period. On Tuesday and Thursday, with some exceptions, class is from 7:35 to 8:45 a.m.
- Class is from 8 to 8:45 a.m. on Monday, Wednesday, and Friday.
- The longer class time two days a week gives extra time to improve the quality of laboratory work and other activities.

TUTORIALS

- Tutorials are held once a week from 7 to 7:50 a.m. on Mondays throughout the year. The tutorials are 50 minutes and sometimes include small lab activities, computer simulations, extra readings, and discussion of assigned topics, which reinforce and enhance the material that we are currently learning.
- Tutorials are optional but strongly encouraged.

LAB COMPONENT [C4]

C4—An understanding of science as a process rather than an accumulation of facts.

- To stress biology and science in general as a process, lab activities emphasize development and testing of the hypothesis; collection, analysis, and presentation of data; and a clear discussion of results.
- AP Biology has 12 recommended lab activities, which constitute 46 days of the school year, approximately 28 percent of class time. We complete these and additional labs, computer simulations, and field trips. Lab assignments must be completed according to the standard format (unless otherwise noted). Lab reports are due one week after the lab is completed.
- Lab work that supports the themes and concepts listed above will be done as often as is feasible and will include the 12 labs that will be covered on the AP Biology Examination. The 12 labs (Dirty Dozen!) are:
 1. Diffusion and Osmosis
 2. Enzyme Catalysis
 3. Mitosis and Meiosis
 4. Plant Pigments and Photosynthesis
 5. Cell Respiration
 6. Molecular Biology
 7. Genetics of Organisms
 8. Population Genetics and Evolution
 9. Transpiration
 10. Physiology of the Circulatory System
 11. Animal Behavior
 12. Dissolved Oxygen and Aquatic Primary Productivity

STUDENT ASSESSMENT

- Students are evaluated in a number of ways that reflect the nature of the course. Some of the skills I stress are:
 1. Scientific reasoning through analysis and synthesis;
 2. Research technique; and
 3. Being able to present one's point of view in writing.

- Students are encouraged to develop group and individual work skills, and these become part of the lab evaluation.

FORMS OF ASSESSMENT/WEIGHTING

- Grades will be calculated on a percentage basis. The value of each individual assignment varies. Students earn a grade based on the quality of the work they complete. Overall class grades are based on a straight percentage, not on a curve (although comprehensive exams will be scaled appropriately—for instance, the exams will be more difficult than the AP Exam, and a 70 percent on the AP Exam multiple-choice section—assuming your free-response section score is decent—will get you at least a grade of 3 on the overall AP Exam). This is how class grades are distributed:

Exams and Quizzes	50%
Labs and Lab Reports	25%
Homework/Daily Work/Readings/Projects	25%

COMPREHENSIVE EXAMS

- Once each grading period, comprehensive exams will be administered, which are part multiple choice (including many questions from old AP Exams) and part free response (also taken from old AP Exams). Like the AP Exams, 60 percent of the grade on the comprehensive exams will be multiple choice and 40 percent will be free response.
- Seven major exams, one every 4.5 weeks, will be cumulative in nature. Approximately 50 percent of exams (after the first one) will cover new material, and 50 percent will cover material previously tested.
- The fourth exam of the year will be given in the form of a semester final exam. All students in AP Biology must take it.
- There will be no end-of-the-year final exam, as the AP Biology Exam will be administered at this time.

QUIZZES

- At least one quiz per unit will be given, and often more. Some quizzes will be announced ahead of time and worth more points, some of the quizzes will specifically focus on vocabulary terms, and some will be “pop” quizzes based on pre-assigned readings, and will be given on an irregular basis. These will not be worth as much, but they will add up over time and encourage you to keep up with the readings.

LAB WORK

- You will be asked to perform a pre-lab, answering questions about the objectives of the upcoming lab. You will also need to read through the entire lab ahead of time, writing a detailed materials list and a flowchart that describes the steps of the lab. This will help prepare you for the lab itself. You will do these on handouts I give you and put them in your AP Biology notebook.
- Once you've done the pre-lab, you will create a section in your composition lab journal with a title, and then—thinking about the type of data you'll be collecting—make blank data tables with appropriate titles, labels, and rows/columns so that as you collect your data you will have a place to write it.
- The post-lab analysis will include questions and require you to graphically express and make sense out of your data. We will always have pre- and post-lab discussions emphasizing critical thinking and analysis. It's very important that you understand *what* we were doing and *why* we did it.

HOMEWORK/DAILY WORK—This will take several forms:

- It may include packets done outside of class over topics that were covered heavily in Pre-AP biology strategies, as a reinforcement/refreshers.
- It will also include take-home free-response questions from previous AP Biology Exams that we haven't seen but which correspond with the current topic. You will have a week to do each one, and we will use the evaluation rubrics to see how you would have done. This will give you repeated practice on the type of questions asked over the years on the free-response section, as well as an understanding of how the rubrics are used to assess your knowledge by the AP Exam Readers.
- Sometimes you will be asked to justify why the correct answers to the “self-quiz” multiple-choice section at the end of the Campbell chapters are correct.
- Points of Main Significance (POMS): Articles will be assigned from time to time which address some issue of the Nature of Science (NOS) as it pertains to science education/learning in science/science history, usually from professional journals like NSTA's (National Science Teachers Association) *The Science Teacher* or more challenging readings from the *Journal of Research in Science Teaching*. You will need to choose a “point of main significance” in the article and, in 30 words or less, express it with clarity. Further instruction on this will be given at the time. [C7]
- Other assignments to help with understanding of the material will be given.

C7—Applications of biological knowledge and critical thinking to environmental and social concerns.

READINGS

- Two readings per quarter will be assigned, for a total of eight in the year. Students will be given a list of science-related books such as *Double Helix* by James Watson, and will be asked to report on them. A list of books will be given to future students as summer break approaches, so reading may be done ahead of time. Most of these can be found at the public libraries here, our school library, or purchased inexpensively (used) at www.half.com or www.amazon.com.

LECTURE/DISCUSSION

- Some of our class time will be spent viewing PowerPoint presentations, overheads, or Flash Player simulations from various online sources.
- You will be given reading assignments ahead of time, and will be expected to have read and studied the topics before coming to class. The pop quizzes over readings at sporadic intervals will help you to do this. You will be more engaged in discussion if you are already familiar with/have grappled with the material.
- I will NOT lecture on everything in the chapter. Again, lessons are designed to highlight the repeating, overarching themes or patterns that thread their way through three major *topics* and the various *themes* addressed earlier in this syllabus. These will be the major organizing principles for all class lectures and discussion. We will be asking ourselves repeatedly, “How does what we’re studying now connect to those themes?”
- As stated earlier in the syllabus, the AP Biology Examination continues to emphasize the concepts and themes of biology. Less weight is placed on specific facts than on the “big ideas” that tie them together. However, you will be responsible on our exams and quizzes for more details than we generally will go over in class on a day-by-day basis, which puts the onus of responsibility on you to work with each other in study groups or by yourself to get some details. I will provide you with “focus sheets” so you know what to spend the most time on.
- Often, some of the short-answer questions at the end of the Campbell chapters will be used as kickoffs for lecture discussions. If you answer these on your own, you will be more prepared.

PRACTICE EXAMS

- Three times per year, students will be given AP Biology Practice Exams, using old released exams. Taking the actual test can (a) help provide experience that will benefit students when the actual test occurs in May and (b) help me assess your knowledge.
- The first will be done as a take-home assignment in the first week of school. It will be scored just like the real exam, using AP rubrics, so we can establish a baseline of knowledge and so I can assess where our strengths lie, to teach you better. I want you to do this without looking up

answers and answer every multiple-choice question. If you feel like you are completely guessing, go ahead and answer the question, but also make a star by it. I will score your test twice, taking the scored questions into consideration, and see whether you're a better guesser or if you should just leave the questions blank so you don't get a deduction for guessing.

- At Christmas, we will take the very same exam home again and do it, and I will rescore it. We will spend some time after Christmas break comparing the grades and discussing our progress.
- The week before the actual AP Biology Exam, we will arrive earlier than normal to school (7 a.m.) on Tuesday, and take another practice exam that you haven't seen yet. On Thursday we will arrive early again and take the free-response section. We will spend the rest of the week discussing the results and doing final review for the real thing.

AP BIOLOGY EXAM

- The Pre-AP biology strategies at this school, combined with the AP Biology course, are more than sufficient preparation for committed students who wish to get high scores on the AP Biology Exam. This test is Monday, May 12, 2008, at 8 a.m. Students who take AP Biology must take the AP Biology Exam. A grade of 3 or higher will save many students time and money in college, depending on their desired degree field. Taking the AP Biology Exam results in a student grade based on a 5.0 GPA scale rather than the normal 4.0 GPA scale, **IF** the student earns a grade of 80 percent or higher in AP Biology.
- The AP Biology Exam is three hours in length and is designed to measure a student's knowledge and understanding of modern biology. The exam consists of an 80-minute, 100-item multiple-choice section, which examines the student's understanding of representative content and concepts drawn from across the entire course; a 10-minute reading period; and a 90-minute free-response section, consisting of four mandatory questions that encompass broader topics. The number of multiple-choice questions taken from each major subject area of biology reflects the approximate percentage of the course as designated in the course description above. In the free-response portion of the exam, usually one essay question is taken from Molecules and Cells, and another question focuses on Heredity and Evolution. Two questions generally focus on Organisms and Populations. Any of these four questions may require the student to analyze and interpret data or information drawn from the laboratory experience, as well as from lecture material, and may require students to integrate material from different subject areas of the course.
- The multiple-choice section counts for 60 percent of the student's exam grade, and the free-response section counts for 40 percent. Within the free-response section, each of the four questions is weighted equally. The answers to the free-response questions must be in essay form; outlines alone or unlabeled and unexplained diagrams alone are not acceptable.

AP Grade	Qualification
5	Extremely well-qualified
4	Well-qualified
3	Qualified
2	Possibly qualified
1	No recommendation

After the AP Biology Exam

- Seniors have no more class assignments the day after the AP Biology Exam, so the following information will not apply to them.
- Juniors will begin one of two final, year-end projects.
 - **Project 1: Create a video called *AP Biology Experience*** or something of the sort. This is rather open-ended, but the goal is to transmit the essence of this past year to next year's AP Biology students. It can be up to 15 minutes maximum in duration. A scoring rubric will be given before you begin, so you will know in more detail what the expectations are.
 - **Project 2: Mystery Powders Lab:** Each student will be given several days to work with a number of different white powders. It is completely open-ended in how you wish to test or analyze the powders. You may work individually or in groups, as you wish. Within the limits of our laboratory, you may perform any manner of tests to evaluate the identifying properties of the powders. You will develop a matrix/flowchart for identifying each powder. You should take into consideration possible interactions between powders if they are mixed. Then, all the individual powders will be taken away, and each of you will be given a test tube with a mixture of the powders to analyze using your matrix. You will be given several days to perform any laboratory procedures that you think are needed, and attempt to discern which powder or powders are present. There can be any percentage of powders in a test tube. A typed, double-spaced formal lab report will be handed in with your final decision, and an outline of the procedures you used to achieve this decision must be included. A more detailed rubric and instructions will be handed to you preceding our lab work.